

Survey Report FRV Walther Herwig III Survey WH394 - 21.03. – 16.04.2016

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Introduction

The mackerel and horse mackerel egg survey forms a part of an ICES-coordinated international study in the Eastern North Atlantic conducted during the first half of 2016. This investigation takes place triennially since the late 1970s and is coordinated by the ICES Working Group on Mackerel and Horse Mackerel Egg Surveys (WGMEGS).

The main objective of this series of individual cruises from January until August is to produce both an index and a direct estimate of the biomass of the Northeast-Atlantic mackerel and the southern and western horse mackerel stocks. The mackerel and horse mackerel egg survey is the main source providing fishery independent information for these stocks.

The general method is to quantify the freshly spawned eggs in the water column on the spawning grounds. To be able to establish a relationship between eggs and spawning stock biomass, the fecundity of the females must also be determined. This is done by sampling sufficient numbers of gonads before, during and after spawning. These samples are then histologically analysed. In combination, the realised fecundity (potential fecundity minus atresia) of the females and the actual number of freshly spawned eggs in the water render an estimate of the spawning stock biomass.

As a consequence of the long spawning period and the large area involved, the mackerel and horse mackerel eggs surveys have been highly international from the very beginning. In 2016 a total of 19 individual cruises with research vessels and chartered fishing vessels will be carried out, with the contribution of Denmark, UK (England and Scotland), Spain, Ireland, Portugal, Germany, the Netherlands, Faroese Islands, Iceland and Norway.

The 394th cruise of FRV "Walther Herwig III" is a contribution to these international efforts assessing and managing the mackerel and horse mackerel stocks. The survey is part of the European data sampling directive established in 2002 and financially supported by the EU.

Verteiler:

TI - Seefischerei

per E-Mail:

BMEL, Ref. 614

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Bundesanstalt für Landwirtschaft und Ernährung, Hamburg

Schiffsführung FFS "Walther Herwig III"

Präsidialbüro (Michael Welling)

Personalreferat Braunschweig

TI - Fischereiökologie

TI - Ostseefischerei Rostock

FIZ-Fischerei

TI - PR

MRI - BFEL HH, FB Fischqualität

Dr. Rohlf/SF - Reiseplanung Forschungsschiffe

Fahrtteilnehmer

Bundesamt für Seeschifffahrt und Hydrographie, Hamburg

Mecklenburger Hochseefischerei GmbH, Rostock

Doggerbank Seefischerei GmbH, Bremerhaven

Deutscher Fischerei - Verband e. V., Hamburg

Leibniz-Institut für Meereswissenschaften IFM-GEOMAR

H. Cammann-Oehne, BSH

Deutscher Hochseefischerei-Verband e.V.

DFFU

Participants

Ms Melanie Buck	TI SF, University of Hamburg
Mr Jens Edinger	TI SF, University of Freiburg
Dr Sven Hammann (1 st leg)	TI SF
Mr William Hunt (1 st leg)	MaREI, University College Cork (Ireland)
Dr Matthias Kloppmann (2 nd leg)	TI SF
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Ms Sabrina Schulz	TI SF, University of Hamburg
Mr Erik Sulanke	TI SF, University of Greifswald
Mr Jens Ulleweit	TI SF, Chief Scientist
Ms Laura Wichmann	TI SF, University of Hamburg

Cruise Itinerary

Date/UTC

21/03, 10:00 hrs	Boarding Bremerhaven (delayed departure due to illness of a crew member)
24/03, 14:00 hrs	Departure Bremerhaven
27/03, 17:00 hrs	Arrival in standard sampling area, start of sampling
08/04, 21:00 hrs	End of sampling
09/04, 10:00 hrs to 11/04, 14:00 hrs	Break in Cobh, Ireland (personnel exchange, extended stay due to weather conditions)
11/04, 18:00 hrs	Arrival in standard sampling area, start of sampling
13/04, 16:30 hrs	End of sampling and departure from survey area
16/04, 10:00 hrs	Early arrival WH III in Bremerhaven due to technical problems (the intended end of the survey was 26/04)

Narrative

In 2016 the entire spawning period of mackerel and horse mackerel was divided into eight sampling periods. According to the survey proposal of the responsible ICES working group it was planned to obtain a full coverage of the entire spawning area throughout all sampling periods. FRV "Walther Herwig III" was advised to contribute to the sampling during the 3rd period from the 21st of March to the 10th of April and during the 4th period from the 11th to the 26th of April. For both periods FRV "Walther Herwig III" was supposed to cover the survey area in the West of Ireland and the Celtic Sea between 53°45`N and 48°15`N and 54°45`N and 50°15`N, respectively. The proposal was to conduct alternate transects during the first part of every leg of the survey and then fill in the missing transects on the way back.

FRV "Walther Herwig III" started at ICES statistical rectangle 26E2 at 48°45`N 007°45`W continuing sampling westwards on the same latitude thereafter. The survey area was then covered by plankton hauls on every other row of statistical ICES rectangles on alternate transects northwards towards 53°45`N being the most northern transect to be covered during the 1st leg. On the way southwards FRV "Walther Herwig III" sampled the remaining transects until 50°15`N. Due to heavy weather conditions the sampling was disrupted several times for intervals of 2 to 8 hours. 96 plankton hauls and four fishing hauls for fecundity sampling were conducted during this leg all together.

The first leg ended with a scheduled personnel exchange on April, 9th in Cobh, Ireland. Because of a passing storm front with wind forces up to 10 Beaufort the stay had to be extended until the afternoon of April, 11th.

Due to the breakdown of the plankton winch no more plankton hauls could be conducted during the 2nd leg of the survey. Therefore, a part of the remaining survey time was used to search for adult mackerel and to conduct fishing hauls for fecundity sampling only. However,

total survey time was shortened substantially. Sampling ended with a fishing haul at 50°03'N 009°41'W. FRV "Walther Herwig III" arrived in Bremerhaven on the 16th of April.

Results of the survey were intermittently communicated to the survey-coordinator. The missing plankton sampling in leg 2 is covered by the Dutch and English surveys. They are covering their and the missed German area on alternate transects. Figure 1 provides an overview over all positions and activities carried out during WH394.

Methods

Plankton

Plankton samples were taken with a Hydrobios "Nackthai" (a modified Gulf sampler) equipped with a CTD probe to measure real time in-situ depth, temperature and salinity as well as the permanent water flow through the mouth opening and outside the net to determine the volume of filtered water.

The "Nackthai" net mesh size was 280 µm. The plankton sampler was towed at a nominal speed of 4 knots through the water at a towing cable lowering as well as retrieval speed of 0.5 ms⁻¹ allowing for a uniform sampling of the water column. Maximum sampling depth was 200 m or 5 m above the sea bed. Ship's and towing cable lowering and retrieval speed were monitored continuously and noted along with data on starting position, date, time (both UTC), weather condition, total cable length, temperature and salinity at pre-defined depths as well as the haul duration.

After completion of each plankton haul the contents of the net was gently washed down into the cod-end bucket that was detached thereafter and the plankton sample was preserved and stored according to the standard WGMEGS operation procedure. The samples were then allowed to stand for at least 12 h before they were further processed to make sure that all organisms were well fixed and soaked with formaldehyde.

Fish eggs in the samples were separated from the remaining plankton organisms by performing the spray method recommended by the WGMEGS report. All fish eggs were sorted into eggs with and without oil globule and counted. Fish eggs with oil globules were then identified by species and staged.

At the end of the cruise all egg samples had been sorted once for mackerel and horse mackerel eggs in total or, as representative sub-samples of up to 200 eggs per sample. At least sub-samples of up to 150 individuals per target species were staged.

Fecundity

For trawling the semi-pelagic net PSN 205 was used. The trawling stations were placed on the shelf edge and on the Porcupine Bank between 100 and 280m depth, since concentrations of mackerel and horse mackerel were expected there. No trawling was conducted in Irish Coral Reef Special Areas of Conservations.

The whole catch was sorted by fish species. Either all mackerel or a subsample of mackerel was selected, of which length and weigh, sex and maturity were determined and otoliths were taken. Furthermore, for mature female mackerel the following parameters were also determined: Length, weight (total, ovary), sex and maturity. Four parallel micropipette samples were then taken of the ovaries. Then the ovaries were removed, sliced into halves and put into different formalin jars.

Micropipette samples and ovaries have been sent to different laboratories for the histological fecundity analysis.

Additional work (marine mammal survey)

Observations were carried out from the Monkey Island during the 1st leg of the survey. Cetaceans were searched for with the naked eye, using binoculars only to confirm identification and numbers. Watch effort was focused on an area dead ahead of the vessel and 45° to either side

using a transect approach. Sightings in an area up to 90° either side of the vessel were recorded, and casual observations to the rear of the vessel were also included. Watches were kept during daylight hours with breaks taken for meal times (09:30 UTC & 15:30 UTC) and as needed otherwise. Positional data were recorded for hours on effort only. Effort was maintained up to a sea state of 6.

Results

Meteorology and Hydrography

The first leg was hampered by heavy weather conditions due to the passing of severe low pressure systems with strong south westerly winds. Good weather conditions were present during the second leg.

During both legs sea temperature at 5 m depth was between < 9.2°C in the North and East and >11.2 °C in the South and West of the sampled area. Temperatures on the shelf were always distinctly cooler than over the shelf edge and beyond it. Due to still wintry conditions the water body was well mixed.

Egg distribution (preliminary results)

Nackthai hauls were only carried out during the 1st leg (sampling period 3). A total of 96 Nackthai catches (2013: 96; 2010: 218) were conducted containing a total of 20284 fish eggs. Only a small proportion of samples contained no fish eggs at all and highest egg densities were encountered above the shelf edge as well as above Porcupine Bank (Fig 2).

Preliminary results show that of all fish eggs, 92% (n=18721; 2013: 21809) were of mackerel and only 0.5 % (n=113; 2013: 288) of horse mackerel, respectively. Other eggs caught in significant numbers were those of hake (*Merluccius merluccius*), blue whiting (*Micromesistius poutassou*), pearlside (*Maurolicus muelleri*), Soleidae and macrourids (Macrouridae). Occasionally, eggs of dealfish (*Trachipterus arcticus*) were caught in oceanic stations (depth >500m). Noticeable is the very low abundance of found horse mackerel eggs (in average 1 egg per haul, 2013: 3 eggs per haul, 2010: 46 eggs per haul).

Mackerel eggs were found in 74% of the plankton samples with the highest abundance above the shelf break and water depths between 125 and 200 m. Highest mackerel egg densities were encountered on the Irish shelf and northerly of the Great Sole Bank (Fig 3). Contrary to 2013 and 2010 where about 40 % of all mackerel eggs were of stages IA and IB, in 2016 only 10% of all eggs were freshly spawned. Figure 4 shows the geographical distribution of these eggs. Mean egg number per station were 197 eggs (all stages; 2013: 311). Highest mackerel egg numbers could be found at 53°45'N 010°45'W with a maximum value of 3671.

Horse mackerel eggs were much less abundant than mackerel eggs (only in 20% of all hauls). Figure 5 shows the horse mackerel egg distribution in the investigation area. All together only 113 horse mackerel eggs (all stages) and 31 horse mackerel eggs in stages 1A and 1B) were found.

Fecundity sampling

8 fishing stations were conducted during the survey, four in each of both sampling periods.

No mackerel aggregations could be detected during the entire survey period 3. Fish were only caught in 2 of the four hauls and mackerel (2 individuals) were only caught in one haul. Total catch consisted of 970kg blue whiting, 5kg hake, 1.5kg horse mackerel, 1kg argentines, 0.5kg haddock and 0.4kg mackerel.

During survey period 4 total catch were 4424kg and consisted of herring (80%), boar fish (16%), mackerel (2.2%) and horse mackerel (0.7%). Other species (sprat, whiting, blue whiting, hake, haddock, John Dory, poor cod) were only caught in very small amounts. All together

119 fecundity samples of mackerel were taken as well as length, sex, maturity and otoliths of a bigger subsample of mackerel.

In contrast to the years before most of the mackerel (male and female) had already spawned but due to the low number of samples this cannot be taken as an indicator for a shift in spawning time.

Cetacean observations (William Hunt, MaREI, University College Cork, Ireland)

A total of 21 sighting events occurred consisting of an estimated 140 individual animals. 6 different species were identified with a further 4 sightings consisting of unidentified dolphin, baleen and beaked whale and a single unidentified marine megafauna species bringing the total to a possible 10 species encountered. By the far the most frequent sighting events were of delphinidae species (15 records). Pilot whales (*Globicephala melas*) were the most commonly encountered of the delphinidae with 6 sighting events recorded while there were also 4 sightings of common dolphins (*Delphinus delphis*). Sighting rate breaks down to 2.85 events per day. Table 1 briefly summarises the results of search effort, while figure 6 displays the distribution of all sighting events.

Table 1: Sightings, counts and group size range for marine megafauna recorded during survey.

Species	No. of sighting events	No. of individuals	Group size range
Fin Whale (<i>Balaenoptera physalus</i>)	1	1	1
Minke Whale (<i>Balaenoptera auctorostrata</i>)	2	2	1
Sperm Whale (<i>Physeter macrocephalus</i>)	1	1	1
Long-finned Pilot Whale (<i>Globecephala melas</i>)	6	55	6-15
Bottlenose Dolphin (<i>Tursiops truncatus</i>)	2	22	7-15
Common Dolphin (<i>Delphinus delphis</i>)	4	54	7-20
Unidentified Beaked Whale	1	1	1
Unidentified Baleen Whale	1	1	1
Unidentified Dolphin	2	2	1
Unidentified Megafauna	1	1	1
Total	21	140	n/a

Acknowledgement

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I wish to thank Captain Hans Otto Janßen and his crew on board FRV “Walther Herwig III” for their great support and co-operation. Also, I would like to thank all members of the scientific team for their hard work especially in very bad weather conditions.

Hamburg, 25/04/2016



Jens Ulleweit
(Cruise Leader WH394)

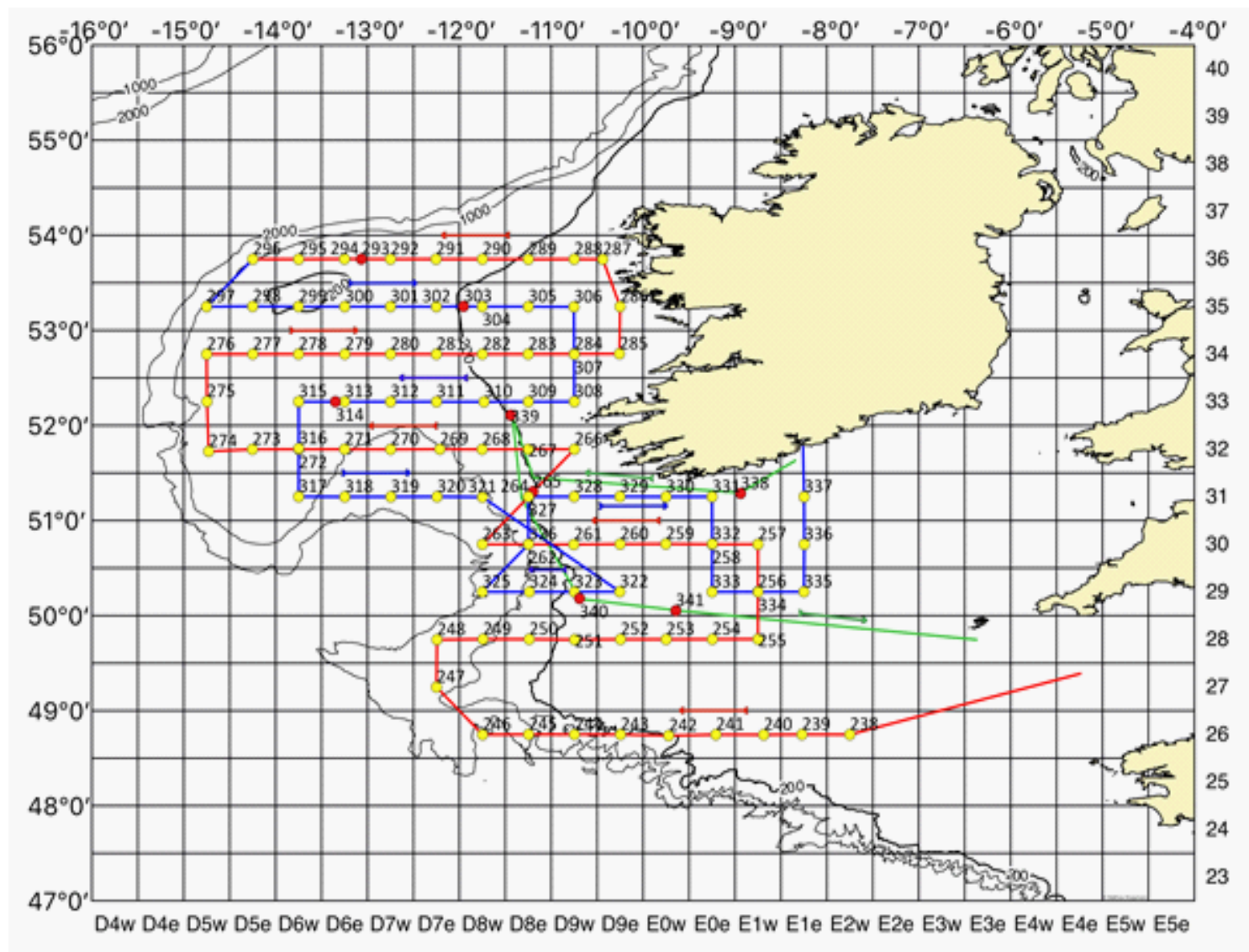


Fig.1: 394th cruise, cruise track and station grid (yellow circles = positions of plankton hauls; red = positions of fishing hauls)

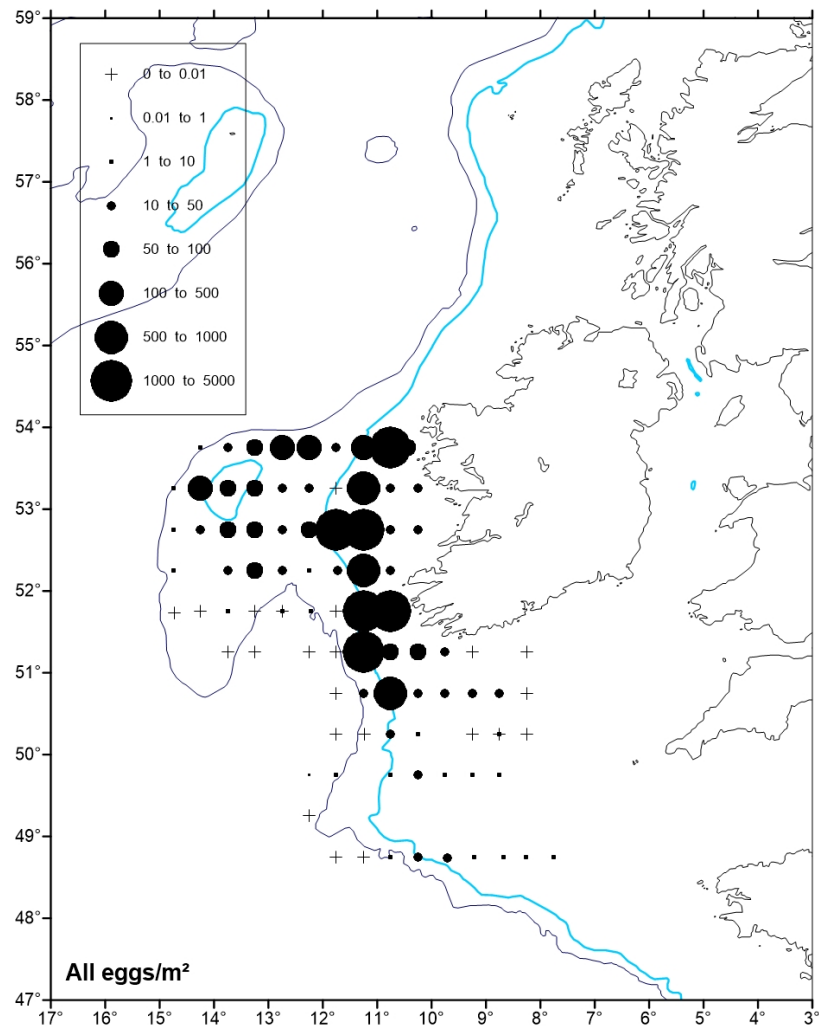


Fig.2: 394th cruise, the distribution of all fish eggs (numbers per m² in sampling period 3)

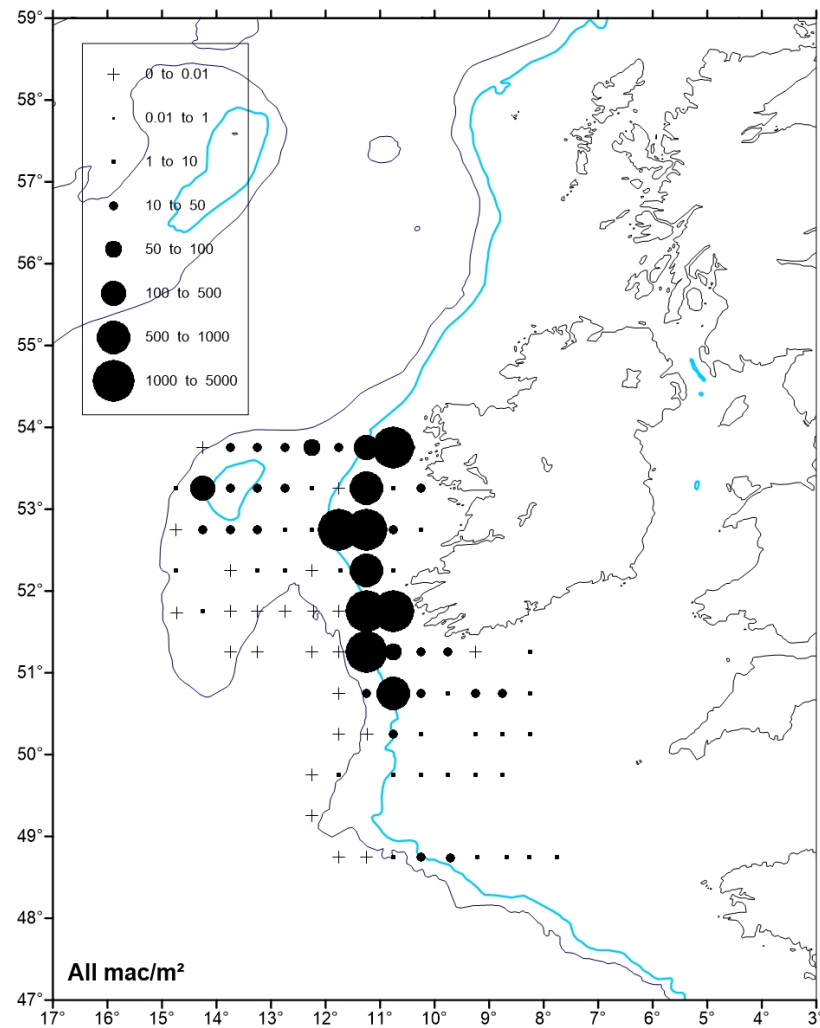


Fig.3: 394th cruise, the distribution of all mackerel eggs (numbers per m² in sampling period 3)

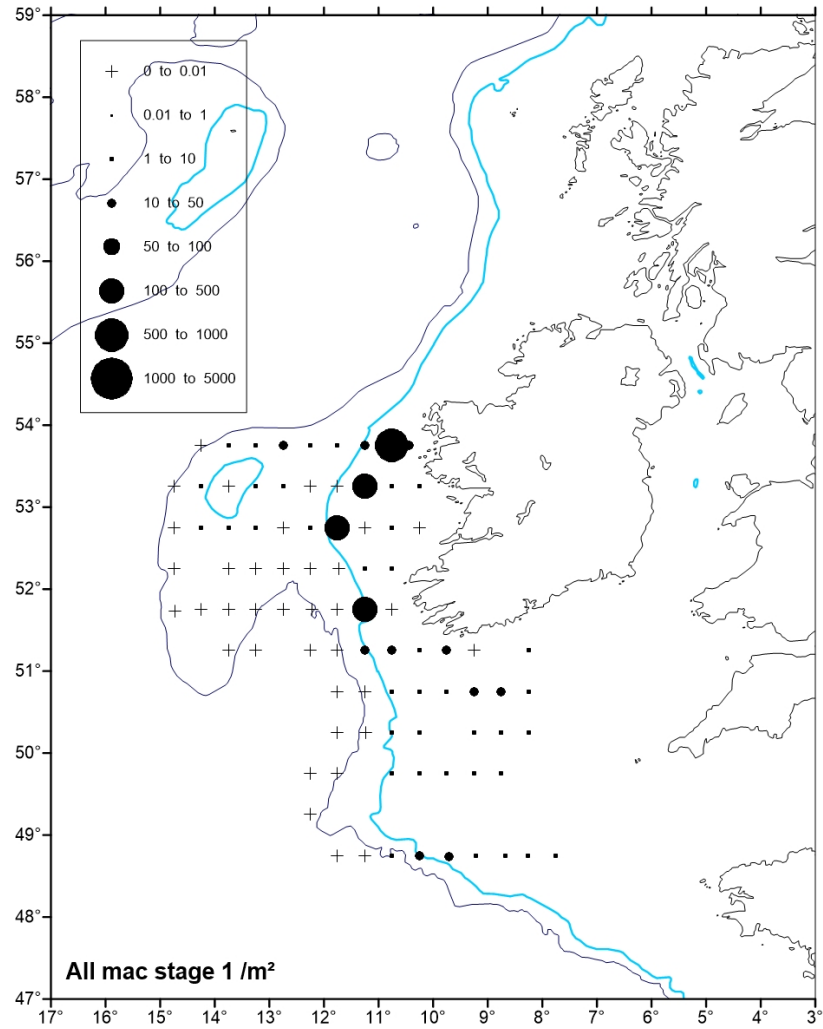


Fig.4: 394th cruise, the distribution of stage 1 mackerel eggs (numbers per m² in sampling period 3)

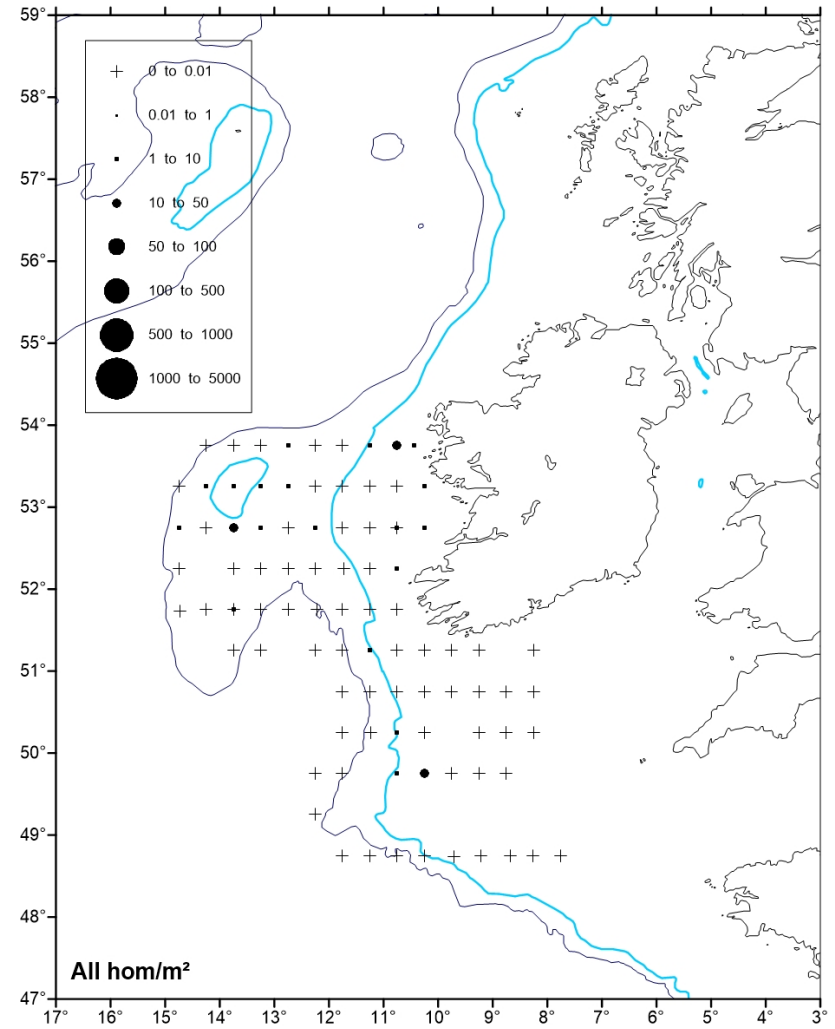


Fig.5: 394th cruise, the distribution of all horse mackerel eggs (numbers per m² in sampling period 3)

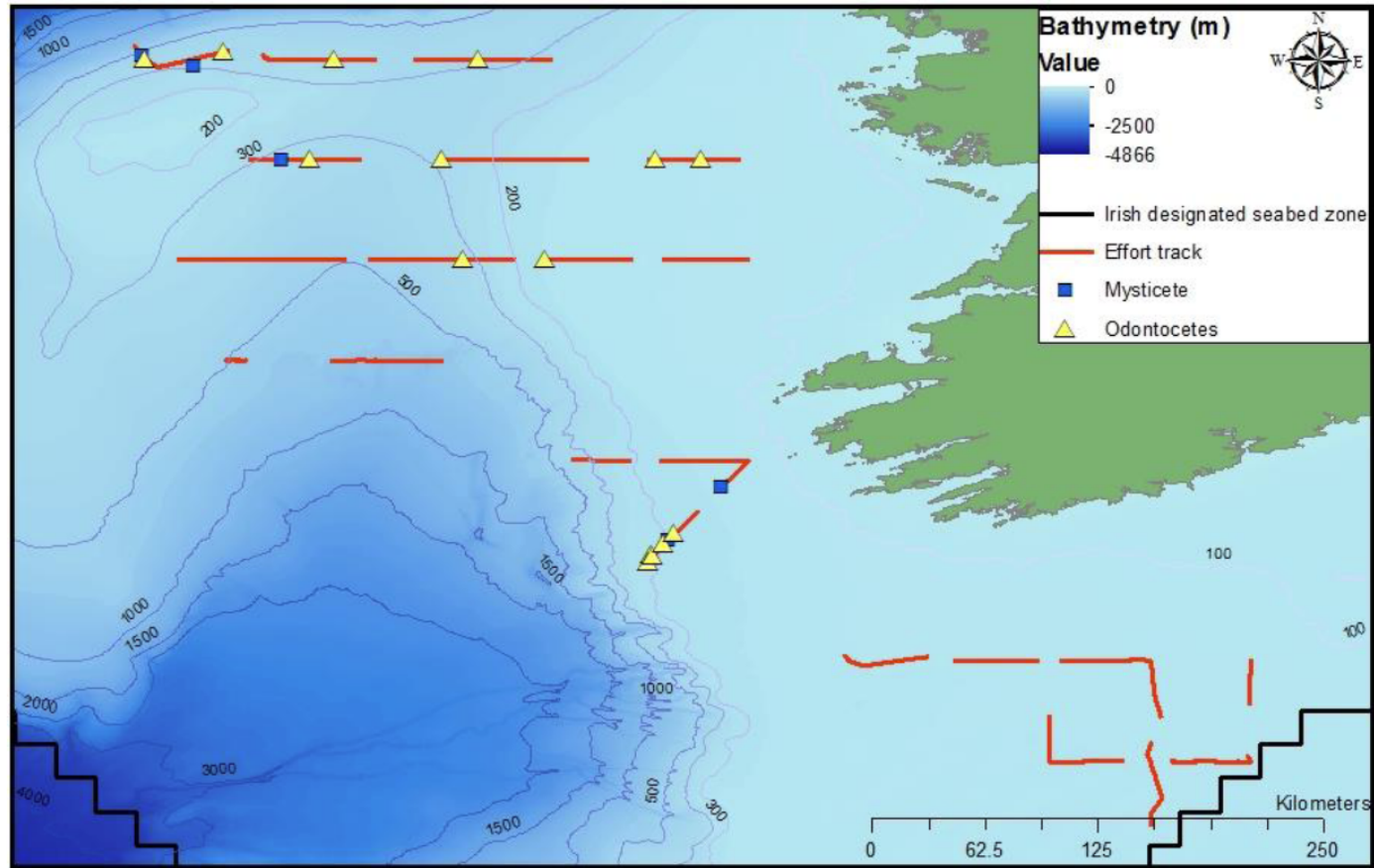


Fig.6: 394th cruise, all cetacean sighting events recorded during survey effort, colour coded to groups (mysticete = baleen whales; odontocetes = toothed whales). Gaps represent no coverage during nightfall or when sea conditions were too poor to maintain effort. Bathymetry data: GEBCO